which ESD build up on the workers may not bleed off due to the clothing of the workers, or the materials used in the office equipment and the office facilities. The system and method of the present invention is intended to keep ESD charges to a minimum to protect equipment and personnel under these circumstances.

Historically, the only impedance in ESD bleed paths is to protect humans from shocks in the event the circuit contacts a high voltage source. As mentioned in the application, this impedance has historically been resistors. The resistors are often placed in wrist band connectors or the like and the resistors so placed are subject to breaking. Any grounding of such circuits thus may not be effective. Further- more, the resistors in such circuits are not strategically located to fully protect all equipment and personnel.

Furthermore, in an assembly area, an assembler's hand may be exposed to sensitive electronics, such as chips or the like. In this environment, the protection must be absolute so that virtually zero voltage is always present on the person's body. Otherwise, a spark may jump and damage the sensitive electronics and cause pain to the worker. Because of the constant connection in the wrist strap situation, spark gap arcing does not take place. Therefore, the discharge paths are generally as close to a direct connection as possible with only a minimal resistor inserted for human safety (in case of a ground cross to 120 volts, for example). A spark will not exist under such conditions. However, such ESD protection circuits have many drawbbacks, such as those discussed in the application.

As discussed at the interview, the inventor has recognized a new environment. In many workplaces, such as call centers, information technology departments, small offices, and the like, workers will repeatedly contact points while working on a work

task. For example, a worker in a call center may repeatedly contact a mouse, or a computer keyboard, or the like while carrying out the work associated with the call center. For example, a typical computer user in a call center may make hundreds of contacts per hour with a mouse pad, and each contact has the potential of producing an ESD event. As discussed at the interview, this situation where the worker is repeatedly contacting various elements while working has created new problems in ESD protection that have not been recognized by the prior art. Not only has the problem itself not been recognized in the prior art, no disclosure in the prior art has been directed to solving such unrecognized problem.

ESD protection is important for both personnel and equipment. Such ESD protection is important because today's clothing, upholstery, floor coverings, and the like cause static electricity buildup and static electricity generation on either or both a person or equipment (in fact, this may partially explain a recent glut of explosions associated with people filling the gas tanks of their automobile). This ESD is not dissipated because the plastic insulative environment (shoes, chairs, plastic equipment cases, plastic controls, plastic and rubber casters and the like) found and used in most modern workplaces prevents efficient discharge of such ESD build up. All of these environments are also characterized by working analog and/or digital equipment systems. Thus, a substantial charge can build up on a person while that person is working and will eventually discharge, sometimes violently, through an unplanned and possibly dangerous and painful path.

Presently, infrastructures (power, ground, signal paths and the like) in offices have not been designed to accommodate ESD protection. In fact, as mentioned above and

at the interview, such ESD protection has not even been contemplated by such offices. Adding ESD protection to such areas may cause damage or upset due to the introduction of high frequency noise or high voltage in a manner that was never anticipated in the original infrastructure or equipment design. Adding ESD protection to such environments may propagate ESD energy (especially high frequencies) into undesired areas with undesired effects. Furthermore, as discussed at the interview, any time additional components are added to such infrastructure, there may be an increase in the chances of a failure or mis-operation.

This adds specific and important requirements to any ESD protection that is to be added to an already-existing infrastructure so that the protection itself does not direct high energy or high frequencies back to equipment or personnel being protected, or so the added equipment does not increase the chance of a failure or a mis-operation. It is also important to realize that the user will not be continually connected to an ESD discharge path (since the inventor is trying to eliminate wrist straps and the like) but only makes periodic contact in such workplace environments. Thus, when the worker does contact an ESD protective device, there may be a significant charge on the person's body so that a significant spark is likely to occur. Furthermore, in work centers, such as a call center, there may be hundreds of users, with each user generating significant spark energy, at coincident points in time. This may produce a cumulative effect within the infrastructure further increasing the importance of properly designed and located high frequency protection.

As discussed at the interview, the inventor recognized that there is significant need for high frequency protection in such environments and where a user will repeatedly contact certain points while the user is carrying out a work task.

As was also discussed at the interview, the inventor has recognized that when there is a spark discharge, the initial instant is rich in high frequencies. There are several reasons that this recognition is important: workers in such environments are not in constant contact (e.g., tethered) to ESD protection systems; in such environments, there may be a multiplicity of users all randomly discharging often coincidently; the infrastructures were never designed in any manner to accommodate the injection of high frequency energy. The wiring and geometry of these infrastructures includes significant wire inductance and coupling capacitance that may inject high frequency energy resulting from, especially, the initial rise time of ESD events, directly into the electronics associated with the work environment in an unplanned manner which can cause damage, system upset or electrical noise.

Thus, protection against high frequency energy for users who may not be in constant contact with an ESD protection system and who may occasionally touch the system while working on a task becomes critical and unapproached and unrecognized in the prior art.

The inventor has recognized that the ESD discharge events described above include many separate events. At the start of each of these events, a very sharp voltage rise time occurs, most often with an accompanying spark of significant energy. An event with a sharp rise time produces a spectrum rich in high frequencies. Spark gaps also produce significant high frequency energy. Thus, it is incumbent upon an ESD protection

system and method in the environment of interest to prevent high frequency energy from penetrating into the system infrastructure where it can cause damaging effects. For similar reasons, it is also advantageous to reduce the voltage or current amplitude of any portion of the electrostatic discharge as it enters the infrastructure.

The inventor has also recognized that today's digital systems, such as PCs, operate with high frequencies, often in the Gigahertz range. Thus, protection of a broad spectrum, including frequencies in this range, is important. Similarly, analog equipment may, in some instances, be amplitude sensitive. Thus, reduction of amplitude is also important. As discussed at the interview, the inventor has found that these requirements may be best accomplished by a combination of resistive and reactive elements arranged to inhibit the disturbing ESD from reaching critical points in a system found in the workplace environment of interest to the inventor.

For example, as discussed at the interview, a series circuit having a one Megohm resistor, and a 10,000 volt ESD discharge at 10 Gigahertz will result in 10 milliamps of disturbance-causing current being injected into the infrastructure; however, adding a series inductor of one millihenry reduces the current at that frequency to approximately 0.16 milliamps, a 60:1 reduction in current. Furthermore, since energy varies as the square of current, this will cause over a 3000:1 reduction in high frequency energy. The series inductor used in this manner thus reduces instantaneous high frequency energy applied to equipment by a factor of as much as several thousand. As discussed above, in the situation of many users who may have each accumulated significant amounts of ESD due to movement, lack of discharge paths, and the like, and equipment that can be damaged by such events, this reduction in instantaneous high frequency energy can be

extremely significant. Also in view of the foregoing, in an environment in which many users may each be touching contact points many times a day, the use of an inductor to reduce instantaneous high frequency energy in an ESD controlling system may also significantly reduce the possibility of any one user receiving a noticeable shock during one of those contacts.

As mentioned at the interview, the inventor has recognized that a series inductor permits the location of an ESD protection device incorporating a series inductor in a position which is strategic to many users and/or many devices at a single user location whereby ESD generated by those users or at those devices can be efficiently located to reduce damaging energy into the infrastructure and even from multiple protection devices.

II. Office Action

A. Claims 1-6, 8, 10-16, 18, 19, 20-26 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Lewis, Jr in view of Ker. The Office Action states that Lewis does not show an inductor and uses the disclosure of the Ker patent of an inductor.

As discussed at the interview, the Ker inductor is disclosed for the purpose of preventing current flow associated with ESD from flowing on the path identified as path B in Figure 5 (on which path, such current would harm gate oxide 600 of chip 100) and force the ESD current to flow on the path identified as path A in Figure 5 (on which path the current will flow through input protection circuit 400 and 500 and back through input pad 200 to ground, see column 6 lines 32-50). It is noted that the input protection circuits are clamp circuits and are in parallel with the element 600. The Ker inductor is a gate element which forces current to flow along one of two paths. It is also noted that the

inductor in Ker is not in series with the input pad 200. As was discussed at the interview, the definition of a series circuit is a circuit where current is the same for all elements in the circuit, and the current at input pad 200 is different from the current at inductor L due to the existence of the clamp circuit with its elements 400 and 500. In summary the Ker patent is a parallel circuit of low impedances as compared to the inventor's series circuit of high impedances. It is noted that, for example, applicant's Claim 1 specifies that the inductor element is in series with an electrostatic discharge conducting contact element. Furthermore, since there is no disclosure in the Ker patent suggesting that input pad 200 is an electrostatic discharge conducting contact element this limitation is also not met by the disclosure of the Ker patent. Therefore, the Ker patent not only does not disclose an inductor in series with an electrostatic discharge conducting element, it does not even disclose an electrostatic discharge conducting element. Therefore, for this reason alone, the claim is not met by the disclosure of the Ker patent. However, as will be understood from this discussion, there is no disclosure in the prior art, and especially in Ker, of an electrostatic discharge conducting contact element that is adapted to be repeatedly contacted by a person while the person is working on a work task. Since the prior art does not even recognize the problem of such repeated contact there could be no disclosure teaching such an element, and such an element in series with an inductor element to protect a person or equipment from the effects of ESD.

It is further noted that the Ker disclosure is directed to chip technology and the Ker patent has no disclosure suggesting or teaching the environment discussed above to which applicant's invention is directed. Furthermore, the Ker input pad 200 is never discussed beyond merely mentioning it. There is no disclosure in the Ker patent

suggesting that the device, or input pad, is to be repeatedly contacted. Certainly, there is no disclosure in the Ker patent that the overall chip disclosed in this patent is to be used in a situation where any part of the chip or all of the chip is to be repeatedly contacted by a worker or used in an environment which has a contact point that is adapted to be repeatedly contacted by a worker. Therefore, there is no element disclosed or suggested in the Ker disclosure that is adapted to be repeatedly contacted by a person while the person is working on a work task.

Furthermore, in the Ker patent, the item of interest is an electronic chip of limited real estate. The only environment of interest in the Ker patent is the very small environment of very selected elements on the chip without regard to the effect of ESD on other devices such as the infrastructure connected to the chip. The protective ESD element in the Ker patent is a voltage sensitive clamp arrangement which turns on and becomes a low resistance clamp point where its non-linear resistance is based on the voltage present. Ker recognizes that the clamp and associated circuitry contains resistance. This resistance may be high enough to preclude the clamp from fully protecting certain low resistance associated parallel devices (such as element 600). Therefore, on purpose, Ker "weakens" the current flow only through element 600 by introducing a slight additional impedance in this path. so it becomes a poorer conduction path than the instantaneous conductance path of the clamp. Thus, current flow is diverted away from element 600 to the clamp. Total ESD disturbance current remains virtually the same in the overall circuit but has only been detoured to an alternate path, as compared to the instantaneous dynamic resistance of the non-linear clamp at that point in time.

Since all the elements in question in the Ker system are in very close proximity and therefore in low resistance relation to each other, only a small amount of additional impedance or resistance need be added to weaken a particular path such as via element 600 in Ker. In fact, this is accomplished by a tiny printed circuit pattern where the added resistance may be as beneficial as the added inductance.

As was discussed in the interview, the topology of the Ker circuit is totally different from the topology of the circuit defined in applicant's claims. The Ker topology includes two paths with the inductor acting as a gate to force current flow along a path that is desired; whereas, the circuit defined in applicant's claims is a single path series circuit. There is no alternate path available in the circuit defined in applicant's claims, thus, the teaching of the Ker disclosure is not applicable to the invention defined in applicant's claims. Furthermore, since there is no disclosure in the Ker patent suggesting that repeated contacts may be made, there is no disclosure in the Ker patent suggesting or teaching the contact element defined in applicant's claims.

The Lewis patent has been previously discussed, and since it was stated in the Office Action that Lewis does not disclose an inductor, and such statement was affirmed at the interview, and since it was further agreed at the interview that there is no disclosure in either Lewis or Ker which teaches one skilled in the art or even motivates one skilled in the art to combine the single series path of Lewis with an inductor which is used as a gate in one path of a multiple path parallel circuit to force current flow through a second path of the multiple path parallel circuit, no further discussion of the Lewis patent will be presented.

Accordingly, in view of the above, Claims 1-6, 7, 8, 10-16, 18, 19, 20-26 should be allowed.

With regard to Claims 19 and 23, as well as Claims 7, 11, 12, 13, 14, 16, 18, 26, 42-46, 47, 48, 49, 61-63 and 77 the above discussion is repeated since these claims stand rejected based on the Lewis and Ker patents.

B. Claims 17 and 34-41 stand rejected under 35 U.S.C. §103(a) as being anticipated (sic) by Lewis, Jr in view of Ker and further in view of Dangelmayer et al. Lewis and Ker are applied as above discussed, and thus the above remarks are referenced and incorporated here with regard to these two patents. The Dangelmayer patent is cited as disclosing a headphone device.

As discussed above, and at the interview, since the Lewis and Ker patents do not disclose the protection device used in the environment defined in applicant's claims, adding the disclosure of a headphone device as disclosed by the Dangelmayer patent does not support a conclusion that the invention defined in Claims 17 and 34-41 is not patentable. The Dangelmayer patent does not have any disclosure supplying the teaching missing from the Lewis and Ker patents and thus adding the disclosure of this patent to the disclosures of those two patents does not render applicant's claimed invention unpatentable.

Accordingly, Claims 17 and 34-41 should be allowed.

C. Claim 9.

Claim 9 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Lewis, Jr in view of Esper. The Office Action states that Lewis does not disclose a transistor, and cites the Esper patent as disclosing a transistor.

It is noted that Claim 9 depends from Claim 1 and therefore includes all of the limitations of Claim 1. Since it is stated in the Office Action that Lewis does not disclose an inductor, and Esper does not disclose an inductor, combining the transistor disclosed by Esper with Lewis does not suggest the circuit defined in Claim 9. In view of the above discussion with regard to the Lewis patent, it is noted that the Esper patent does not supply the teaching missing from the Lewis patent, and combining the disclosure of the Esper patent with the disclosure of the Lewis patent does not render applicant's claimed invention unpatentable.

It should also be noted that the Esper patent does not address ESD, but merely low voltage low current charges on the human body, an entirely different and unrelated operating environment. The main purpose of the transistor is to turn on a light when this minimal current flow from the body is taking place. Note that since no pulse-widening circuit is include the discharge turning on the light must be long enough to be seen directly via the human eye. Borrowing from motion picture standards, this implies a discharge tome of at least 50 milliseconds (magnitudes longer than ESD discharge times) and probably into seconds. Further, the transistor in Esper, with base-emitter connection, does not provide any dynamic control of discharge as does the collector-emitter connection of the inventor's circuit.

C. Claims 20, 21, 27-33, 55, 75 and 76.

Claims 20, 21, 27-33, 55, 75 and 76 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Lewis in view of Ker and further in view of Johnson. Lewis and Ker are applied as discussed above, and Johnson is cited as disclosing a three prong plug.

It is noted that Claims 20, 21, 27-33, 55, 75 and 76 are all dependent claims and add further limitations to the claims from which they depend. It is also noted that the Lewis and Ker patents are applied as above discussed, and thus will not be discussed but reference is made to the above discussion which is incorporated here. As discussed above, and at the interview, since the Lewis and Ker patents do not disclose the protection device used in the environment defined in applicant's claims, adding the disclosure of a three prong plug as disclosed by the Johnson patent does not support a conclusion that the invention defined in Claims 20, 21, 27-33, 55, 75 and 76 is not patentable. The Johnson patent does not have any disclosure supplying the teaching missing from the Lewis and Ker patents and thus adding the disclosure of this patent to the disclosures of those two patents does not render applicant's claimed invention unpatentable.

Furthermore, as discussed in the interview, the inventor has discovered that a series inductor can be combined with selected values of resistance in a plug situation or other convenient mounting, such as a wall outlet box or ESD grounding module to achieve a device that can be strategically located to protect infrastructure in a work environment such as discussed above while permitting virtually any classical ESD device or combination of ESD devices, and/or other devices which would benefit from being grounded via a high impedance ESD ground such as analog or digital data cable shields, or the like to be connected and still offer additional personnel protection as well. For example, using the device embodying applicant's claimed invention, a normally unprotected work station banana plug used to interface with wrist straps as well as various ESD mats, and the like, may be simultaneously connected to a single plug having

therein an inductor and a resistor connected together in series as defined in applicant's claims and can be used to protect equipment and personnel from ESD damaging effects and to even provide a high degree of isolation between devices so connected to the plug.

D. Claims 50-51.

Claims 50 and 51 stand allowed. Therefore, no comments will be directed to these claims.

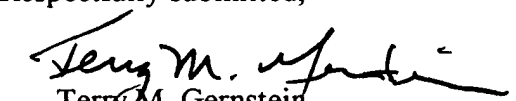
III. Conclusion

In view of the foregoing, all of the claims as now submitted should be allowed.

The remaining references included in the file have been reviewed. Applicant observes that none of these references has disclosure rendering the claimed invention unpatentable.

In view of the foregoing amendments and remarks, it is believed that this application is now in condition for allowance. Accordingly, review and allowance are requested.

Respectfully submitted,



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July 11, 2003